इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 10131 (1992): Link Chain Ends and Chain Bows for Bucket Elevators [MED 14: Cranes, Lifting Chains and Related Equipment]

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

IS 10131 : 1992

भारतीय मानक

डोल उत्थापकों के लिये कड़ीदार जंजीर सिरे और मोड़ — विशिष्टि

(पहला पुनरीक्षण)

Indian Standard

LINK CHAIN ENDS AND CHAIN BOWS FOR BUCKET ELEVATORS — SPECIFICATION

(First Revision)

UDC 621 86 055 : 621 : 867 3

© BIS 1992

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

March 1992

Price Group 4

Cranes and Lifting Chains Sectional Committee, HMD 14

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Cranes and Lifting Chains Sectional Committee had been approved by the Heavy Mechanical Engineering Division Council.

This standard, first issued in 1982, has been revised to include the requirements of chain bows used in bucket elevators to make it a comprehensive specification.

Chain ends and chain bows covered in this specification are used in bucket elevators in cement plants, power plants, fertilizer plants and for other similar applications

Only electric resistance/flash butt-welded steel chains are covered in this specification.

Repairs to chains and chain bows is not recommended as these are case hardened and case carburized with high hardness.

The reliability of chain ends and chain bows is an important factor and, therefore, it is recommended that supply may be obtained from manufacturers possessing adequate facilities for heat-treatment and testing and employing competent staff for detailed inspection.

In the formulation of this standard, assistance has been derived from DIN 764 'Round steel link chains for conveyors; Grade 3, calibrated, tested, pitch 3·5d' issued by Deutscher Normenaushuss.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)' The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 1 JULY 2003
TO
IS 10131 : 1992 LINK CHAIN ENDS AND CHAIN BOWS FOR BUCKET ELEVATORS — SPECIFICATION

(First Revision)

(*Page* 8, *Annex* A) — Substitute the following for the existing

ANNEX A

(*Clauses* 6.1 *and* 6.2)

A-1 RECOMMENDED VALUE OF CASE DEPTH AND HARDNESS FOR CHAIN ENDS

Nominal Chain Size, d_n mm	*Case Depth* mm	*Tolerance on Case Depth* mm	*Surface Hardness*, HRC
12 to 28	0.1 d_n	±0.01 d_n	
30 to 42	0.1 d_n	±0.01 d_n	58 to 62
		±0.01 d_n	

A-2 RECOMMENDED VALUE OF FLAME/INDUCTION HARDENING DEPTH AND HARDNESS FOR CHAIN BOWS

Depth of hardening at seat = 0.1 d_1 mm

Surface hardness at seat = 55 to 60 HRC

(ME 14)

Reprography Unit, BIS, New Delhi, India

Indian Standard
LINK CHAIN ENDS AND CHAIN BOWS FOR BUCKET ELEVATORS — SPECIFICATION
(First Revision)

1 SCOPE

1.1 This standard covers the requirements for link chain ends and chain bows used with bucket elevators The strength of chain ends are equal to chains of Grade M (4) and S (6) These are electrically welded round link chains and comply with IS 5616 : 1982 Sizes from 12 to 42 mm are covered under this standard

1.2 Chain ends and chain bows covered in this standard are wear resistant. Only case carburized chains are covered. Accordingly chain bows are either flame hardened or induction hardened at crown to suit respective chain ends.

2 REFERENCES

2.1 The following Indian Standards are necessary adjuncts to this standard.

IS No.	*Title*
226 : 1975	Structural steel (standard quality) (*fifth revision*)
2853 · 1964	Method of determining austenitic grain size of steel
3469 (Parts 1 to 3) : 1974	Tolerances for closed die steel forgings (*first revision*)
4218 (Parts 1 to 6) : 1976	ISO metric screw threads
5517 . 1978	Steels for hardening and tempering (*first revision*)
5616 . 1982	Short link chain for lifting purposes — General conditions of acceptance (*first revision*)
6416 · 1988	Method for measuring case depth of steel (*first revision*)

3 TERMINOLOGY

For the purpose of this standard the following definitions, in addition to those given in IS 5616 : 1982, shall apply

3.1 Chain End

One continuous length of specified number of links.

3.2 Chain Bow

A U-shaped link with threaded ends which go into bucket holes and are fastened to the bucket with the help of distance piece and nuts.

3.3 Distance Piece

A piece of flat steel having two similar holes used for fastening of chain bows to the bucket with the help of nuts.

4 DIMENSIONS

4.1 Material Diameter

a) *Chain End* — The material diameter of any section of the finished link is the mean of two diameters measured in the same plane at right angles and shall conform to the nominal size d_n. The measurements shall be made away from the weld

b) *Chain Bow* — The material diameter of a finished bow shall be measured at the straight portion of bow opposite to the threads. It is the mean of two diameters measured in the same plane at right angles and shall conform to the nominal size d_1 within stated tolerances

c) *Other Dimensions* — The dimensions of chain end, chain bows and distance pieces shall be as given in Tables 1, 2 and 3 respectively. The thread of chain bows shall have coarse pitch conforming to IS 4218 (Parts 1 to 6) : 1976.

4.1.1 *General Tolerances*

4.1.1.1 *Chain ends*

a) *Tolerances on diameter of the material in the link* — For nominal sizes up to and including 18 mm, the diameter 'd_n' of the material in the finished link shall nowhere differ from the nominal diameter by more than +0·5 mm or — 6 percent, except at the weld.

   For sizes above 18 mm, the diameter 'd_n' of the material in the finished link shall nowhere differ from the nominal diameter by more than ± 5 percent, except at the weld.

b) *Tolerance at the weld* — The dimensions of the steel at the weld shall nowhere be less than the diameter of the steel adjacent to the weld or exceed it by more than the following tolerances:

   i) *Asymmetric welded chain* — 20 percent of the nominal diameter in the direction perpendicular to the plane of the link and 35 percent in any other plane.

   ii) *Smooth welded chain* — 8 percent of the adjacent steel.

c) *Area affected dimensionally by welding* — The weld or welds are positioned in the centre of one or both legs of the link. The area affected dimensionally by welding shall not extend by more than 0·6 times the material diameter to either side of the centre of the link.

4.1.1.2 *Chain bows*

a) The permissible tolerance on pitch (*P*) and thread centre (*C*) shall be as specified in Table 2.

b) The tolerance on other dimensions shall be in accordance with IS 3469 (Parts 1 to 3) : 1974.

4.1.2 *Length and Width*

4.1.2.1 *Preferred nominal dimensions*

a) Pitch *P* (that is, inside length) : 3·5 times the nominal diameter (d_n).

b) Outside width *W* shall be as specified in Table 1.

4.1.2.2 *Tolerances*

a) *Outside width* (*W*) — measured clear of the weld zone, it shall not vary from the nominal outside width by more than $^{+0.075}_{-0}\,d_n$. At the weld zone, the outside width shall not be more than 1·05 times at the adjacent width.

b) The tolerances on the inside length of one link or the sum of the inside length of a specified number of links shall be according to the dimensions given in Table 1.

c) The difference in lengths of the chains in a matched pair shall not be more than 1 mm.

5 MATERIAL

5.1 Chain-Ends

5.1.1 The steel used shall be produced by the open hearth or electric process or by an oxygen-blown process. It shall be fully killed and possess reliable welding qualities and when heat-treated be capable of producing in the finished chain, the mechanical properties required by this specification.

5.1.2 In its finished state, as supplied to the chain maker, it shall meet the following requirements as determined by check analysis on the rod, wire or finished link.

5.1.3 Its content of sulphur and phosphorus shall be restricted as follows:

	Cast Analysis (Percent)	*Check Analysis* (Percent)
Sulphur (*Max*)	0·035	0·04
Phosphorus (*Max*)	0·035	0·04

5.1.4 The steel shall be made in conformity with fine grain practice to give an austenitic grain size of 5 or finer when tested in accordance with IS 2853 : 1964. This could be accomplished by ensuring that it contains sufficient aluminium, or an equivalent element, to allow the manufacture of chain stabilized against, strain-age embrittlement during service; a minimum value of 0·02 percent metallic aluminium is recommended for guidance.

5.1.5 For Grade (*S*) chains, it shall be an alloy steel containing at least one of the following elements or *their equivalents*:

Nickel
Chromium
Molybdenum
Boron

Neither manganese nor silicon shall, in this context, be considered as alloying element.

5.2 Within the above limitations it is the responsibility of the chain maker to select a steel, so that the *finished chain, suitably heat-treated,* meets the specified mechanical properties.

5.3 Chain Bows

5.3.1 The material for chain bows to be used with case carburized chains shall be made out of steel 45C8 (C45) conforming to IS 5517 : 1978 or any other steel to meet the specified mechanical properties.

5.4 Distance Piece

The distance piece shall be manufactured from steel conforming to IS 226 : 1975.

6 HEAT TREATMENT

6.1 Case hardened chain ends shall be case carburized in a suitable manner to achieve the required case depth and surface hardness. Recommended depth of case and hardness are given in Annex A.

6.2 Chain bows shall be hardened and tempered to a surface strength of 1 000 to 1 200 N/mm² (310-360 BHN). The crown of the chain bows shall be specially flame hardened (*see* Figure in Table 2). Recommended depth of hardness and values are given in Annex A.

7 PROOF LOADING

After manufacture and suitable heat treatment or case hardening, each chain end and chain bow shall be tested to the proof load as given in Tables 4 and 5 respectively.

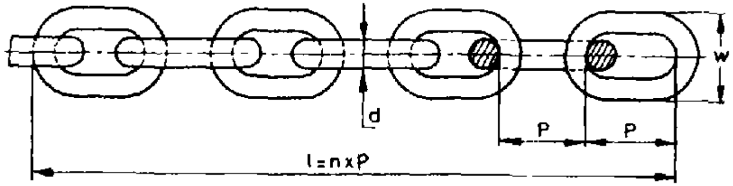
8 TEST REQUIREMENTS

8.1 Selection of Samples

Samples shall be selected in accordance with IS 5616 : 1982. The lot from which a sample is selected by the Inspector shall consist of 200 chain ends or chain bows or part thereof.

Table 1 Dimensions of Chain Ends

[*Clauses* 4.1 (c), 4.1.2.1 (b) *and* 4.1.2.2 (b)]



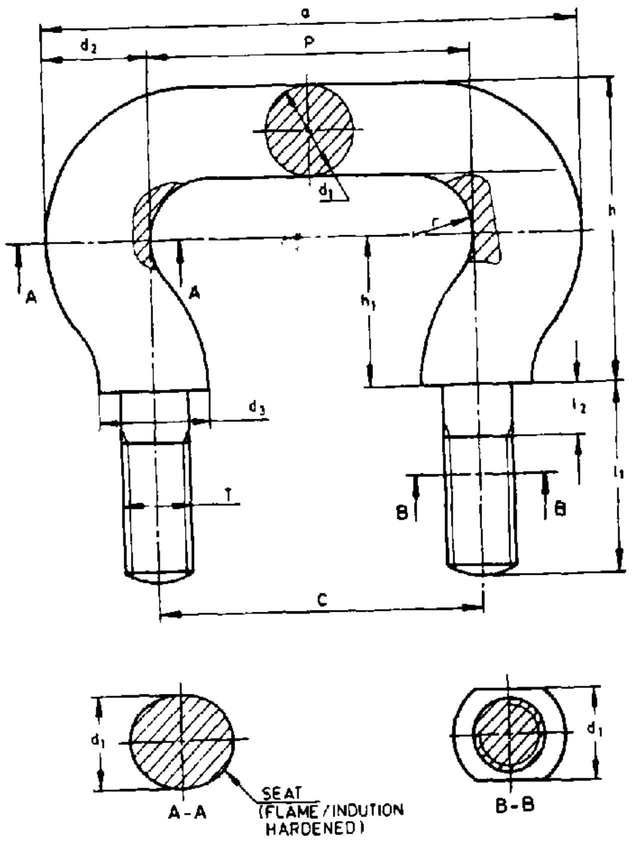
All dimensions in millimetres

Nominal Size d_n	Tol on Dia	Pitch, P 3.5 d_n	Permissible Variation on Pitch	Outside Width W	Minimum Inside Width of End Links	Recommended No. of Links per Chain End, n	Inside Length of Chain End, l	Permissible Tolerance on Length	Approx Weight per Chain End kg	Nominal Size and Pitch of Appropriate Chain Bow d_1	
12	±05 -075	45	±10	45	17	9	405	+30 -10	11	15	56
14	±05 -085s	49	±10	49	18	9	441		17	15	56
16*	±05 -1.0	56	±15	56	20	9	504	+40 -15	26	18	63
18*	±05 -11	63	±15	63	22	9	567		37	20	70
20*	±10	70	±20	70	25	7	490	+45 -20	40	23	80
22	±11	77	±20	77	29	7	539		53	26	91
23*	±115	80	±20	81	29	7	560		60	26	91
25	±125	88	±20	88	33	7	616		77	30	105
26*	±13	91	±20	91	33	7	637		86	30	105
28	±14	98	±25	98	36	7	686	+60 —25	108	30	105
30*	±15	105	±25	105	39	7	735		134	36	126
32	±16	112	±30	112	42	7	784		161	36	126
36*	±18	126	±30	126	47	7	882	+80 -30	230	42	147
40	±20	140	±35	140	52	7	980		310	42	147
42*	±21	147	±35	147	54	7	1029		370	42	147

*Preferred sizes.

Table 2 Dimensions of Chain Bows

[*Clauses* 4.1 (c), 4.1.1.2 (a) *and* 6.2]

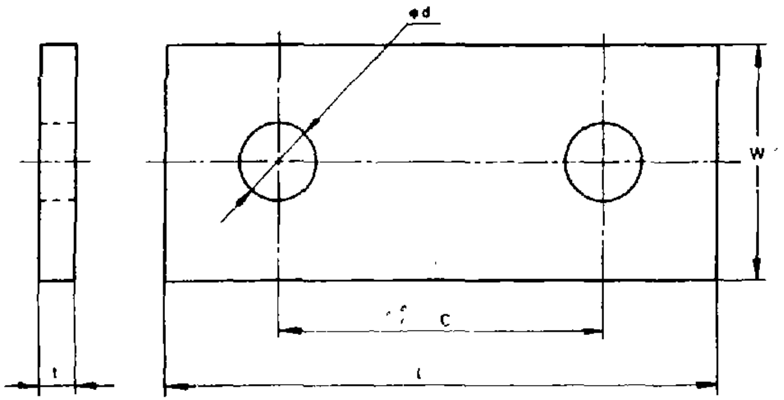


All dimensions in millimetres.

Nominal Size d_1	Inside Pitch P	Permissible Tolerance on Pitch (P)	Thread Centre C	Permissible Tolerance on Thread Centre (C)	a	d_3	d_4	h	h_1		T		r
15	56	- 0·5 +1·0	56	±0·4	92	18	19	50	25	32	M12	9	10
18	63		63		105	21	23	60	30	40	M16	8	11
20	70		70		116	23	29	68	34	45	M20	8	12
23	80	- 1·0 +1·5	80	±0·5	132	25	30	74	37	45	M20	8	13
26	91		91		149	29	34	86	43	55	M24	10	15
30	105		105		173	34	38	100	50	55	M24	10	17
36	126	- 1·5 +2·0	126	±0·6	206	40	44	118	59	70	M30	16	20
42	147		147		239	46	50	136	68	70	M30	16	23
42	147		147		239	46	50	136	68	85	M36	16	23

Table 3 Dimensions of Distance Piece

[*Clause* 4.1 (c)]



All dimensions in millimetres.

Centre Distance *C*	Tolerance on Centre Distance	Hole Diameter *d*	Tolerance on Hole Diameter	Length	Width	Thickness *t*	Approximate Weight per 100 Pieces kg
56	±0·2	13	±0·2	95	40	6	17
63		17		110	40	6	20
70		21		120	50	6	25
80	±0·25	21	±0·2	130	50	6	28
91		25	±0·25 - 0·2	150	60	8	50
105		25		165	60	8	56
126	±0·3	31	+0·3 - 0·2	200	70	10	100
147		31		200	70	10	110
147		37		230	80	12	153

8.2 Proof Test

10 samples of chain ends and chain bows shall be subjected to proof force as given in Tables 4 and 5 respectively. No failure shall be permissible.

8.3 Breaking Load Test

When tested to destruction, the breaking load shall not be less than the minimum breaking load as specified in Tables 4 and 5.

8.4 Hardness and case depth for case hardened chain ends and matching chain bows shall be measured in accordance with IS 6416 : 1971.

8.5 Retests

If any sample fails to fulfil the test requirements of **8.3** and **8.4**, two further samples may be selected at the request of the manufacturer from the same lot of chain ends for retesting. The lot shall be considered as *conforming to this standard only* if both the *additional* tests are satisfactory.

9 INSPECTION

9.1 Acceptance Procedure — The acceptance procedure specified in IS 5616 : 1982 shall be followed to determine the acceptability or otherwise of the chain ends and chain bows.

10 MARKING

10.1 Quality Marking

The chain ends shall be marked with 'M' or '4' 'S' or '6' in a circle (that is Ⓜ or ④ Ⓢ or ⑥), as recommended in IS 5616 : 1982 and followed by 'C', indicating carburised chains.

10.2 Identification Marking

The identification marking shall comply with the requirements of IS 5616 : 1982.

10.3 Inspection Marking

Inspection marking shall comply with the requirements of IS 5616 : 1982.

11 TEST CERTIFICATE

The manufacturer shall supply a certificate of test and examination in accordance with **9.2** of IS 5616 : 1982 with every supply of chain

Table 4 Test Requirements for Chain Ends
(*Clauses* 7, 8.2 *and* 8.3)

Nominal Size d_n	Proof Load		Breaking Load	
	Grade M	Grade S	Grade M	Grade S
mm	kN	kN	kN	kN
12	30	35	60	70
14	40	45	80	90
16*	50	60	100	120
18*	63	75	126	150
20*	80	96	160	192
22	95	110	190	220
23*	100	120	200	240
25	120	240	240	280
26*	126	151	252	302
28	150	170	300	340
30*	170	204	340	403
32	210	230	420	460
36*	250	300	500	600
40	280	340	560	680
42*	340	408	680	816

*Preferred sizes.

Table 5 Test Requirements for Chain Bows (Both Hardened and Tempered and Seat Hardened)
(*Clauses* 7, 8.2 *and* 8.3)

Nominal Size d_r	Pitch P	Proof Load kN	Minimum Breaking Load kN	Approximate Mass per Piece kg
15	56	50	112	0·36
18	63	63	142	0·60
20	70	80	176	0·90
23	80	100	230	1·13
26	91	126	300	1·83
30	105	170	395	2·40
36	126	250	570	4·00
42	147	340	775	5·56
42	147	340	775	6·50

ANNEX A

(*Clauses* 6.1 *and* 6.2)

A-1 RECOMMENDED VALUE OF CASE DEPTH AND HARDNESS FOR CHAIN ENDS

Nominal Chain Size, d_n mm	*Case depth* mm	*Tolerance on Case Depth* mm	*Surface Hardness* HRC
12 to 28	0·1 d_n	+ 0·01 d_n	58 to 62
30 to 42	0·1 d_n	+ 0·01 d_n − 0·02 d_n	

A-2 RECOMMENDED VALUE OF FLAME/INDUCTION HARDENING DEPTH AND HARDNESS FOR CHAIN BOWS

Depth of hardening at seat = 0·1 d_1 mm

Surface hardness at seat = 55 to 60 HRC

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations Enquiries relating to copyright be addressed to the Director (Publications), BIS

Revision of Indian Standards

Indian Standards are reviewed periodically and revised, when necessary and amendments, if any, are issued from time to time. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition. Comments on this Indian Standard may be sent to BIS giving the following reference :

Doc : No. HMD 14 (886)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices:	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	331 01 31 331 13 75
Eastern : 1/14 C. I. T. Scheme VII M, V I. P. Road, Maniktola CALCUTTA 700054	37 86 62
Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036	53 38 43
Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113	235 02 16
Western : Manakalaya, E9 MIDC, Marol, Andheri (East) BOMBAY 400093	6 32 92 95

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. PATNA. SRINAGAR. THIRUVANANTHAPURAM

Printed at Printrade, New Delhi, India